



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/573,661	03/28/2006	Hiroshi Tokairin	287343US0PCT	5655
22850	7590	01/19/2011	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			BOHATY, ANDREW K	
			ART UNIT	PAPER NUMBER
			1786	
			NOTIFICATION DATE	DELIVERY MODE
			01/19/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/573,661	TOKAIRIN ET AL.	
	Examiner	Art Unit	
	Andrew K. Bohaty	1786	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 04 November 2010 and 06 December 2010.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-20 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2010/12/06</u> | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 6, 2010 has been entered.
2. This Office action is in response to the amendment filed November 4, 2010, which amends claim 1. Claims 1-20 are pending.

Response to Amendment

3. The applicant's amendment of the claims, filed November 4, 2010, has caused the withdrawal of the rejection of claims 1-5 and 8-20 under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (WO 03/087023) in view of Fukuoka et al. (JP 2003-272857) as set forth in the Office action mailed June 4, 2010.
4. The applicant's amendment of the claims, filed November 4, 2010, has caused the withdrawal of the rejection of claims 6 and 7 under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (WO 03/087023) in view of Fukuoka et al. (JP 2003-272857) and Suzuki et al. (US 2002/0177009) as set forth in the Office action mailed June 4, 2010.

Response to Arguments

5. Applicant's arguments filed November 11, 2010 have been fully considered but they are not persuasive.



6. Regarding applicant's arguments that  are not considered an unsubstituted aryl group having 20 nuclear carbon atoms, the meaning of aryl groups is very broad and includes substituted phenyl group, such as biphenyl. If the applicant



believes  is not an unsubstituted than the applicant's teaching the biphenyl and terphenyl are unsubstituted aryl groups cannot be made. Biphenyl, terphenyl, and



 all consist of a phenyl group substituted with a fully conjugated hydrocarbon group. The applicant needs to provide a more elaborate explanation of why one of ordinary skill in the art would consider biphenyl and terphenyl to be aryl



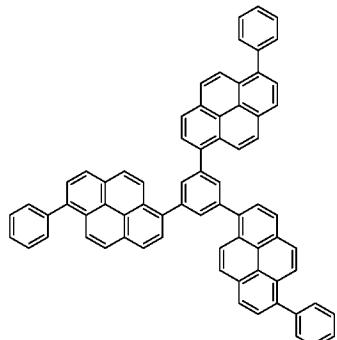
groups and not , all the groups are substituted phenyl groups, where the phenyl group is the aryl group. Therefore, the applicant's arguments are not persuasive.

7. In response to the applicant's arguments that the applicant's device shows unexpected results compared to the example 1 of Fukuoka, Fukucka was used to show

that the host material of the yellow light emitting layer can be the same as the host material of the blue light emitting material. Fukuoka was not used to incorporate DPVDPAN as a host material. Since the applicant's do not provide results to show that their host materials are superior to Ikeda's host materials the applicant's arguments are not persuasive.

8. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Suzuki teaches formula (X), which can be bound to any of the formula (I)-(VII) (paragraph [0020]). Suzuki further teaches that R₂₁ can be a substituted or unsubstituted aryl group, such as phenyl, biphenyl, and terphenyl (paragraphs [0021] and [0035]) leading to asymmetric pyrene groups. In compound 27, Suzuki teaches an asymmetric pyrene wherein both the applicant's Ar³ and Ar⁴ positions in formula (V) contain either a substituted or unsubstituted aryl group. Given the teachings of Suzuki in both the general formulae and the examples, it would have been obvious to one of ordinary skill in the art to try to make a compound with the following structure,

Art Unit: 1786



. Furthermore, the applicant did not provide any unexpected results showing the applicant's compounds perform better than the compounds of Suzuki.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

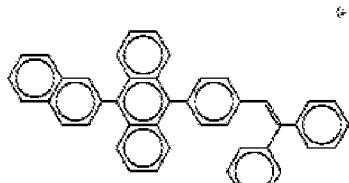
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1-5 and 8-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (WO 03/087023), wherein Ikeda et al. (US 2005/0214565) (hereafter "Ikeda") is used as the English translation, in view of Fukuoka et al. (JP 2003-272857)

Art Unit: 1786

(hereafter “Fukuoka”), wherein a machine translation if used as the English translation, and Azuma et al. (JP2000-007604) (hereafter “Azuma”), where a machine translation is used as the English translation.

12. Regarding claims 1-5 and 8-20, Ikeda teaches an organic electroluminescent device comprising an anode, a hole injecting layer composed of TPD232 (applicant’s formula (X)) disposed on the anode (claims 15 and 16, paragraphs [0143] and [0151]), a hole transporting layer composed of BPTPD (applicant’s formula (XI)) disposed on the hole injecting layer (claims 17 and 18, paragraphs [0143] and [0151]), a light emitting layer disposed on the hole transporting layer, an electron transporting layer composed of Alq disposed on the light emitting layer (claims 19 and 20, paragraph [0143] and [0151]), and a cathode disposed on the electron transporting layer (paragraphs [0143] and [0151]). Ikeda further teaches that the light emitting layer is composed of an asymmetric compound that emits blue light and the asymmetric compound can be a host material (claims 2 and 3) (paragraphs [0143] and [0151], compound A1, Table 1). Ikeda teaches the asymmetric compound is a host material for a blue emitting styrylamine based light emitting molecule (claims 3, 8, 13, and 14) (paragraphs [0151] and [0152]) compound D1). Ikeda teaches A1, A2, and B10 as a preferred asymmetric compound (claims 1, 4, and 5) (paragraphs [0046], [0143], [0146] and [0151]).



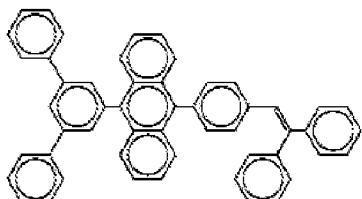
Compound A-1

· reads on applicant's formula (I) where R¹-R⁸

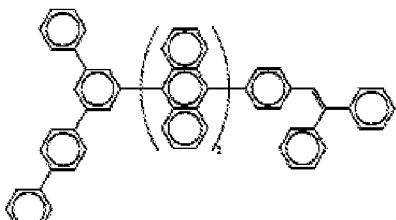
are hydrogen, Ar¹ is an unsubstituted aryl group having 10 nuclear carbon atoms, and

Art Unit: 1786

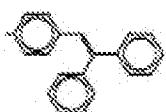
Ar² is an unsubstituted aryl group having 20 nuclear carbon atoms (claims 1 and 4).



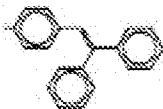
Compound A-2, , reads on applicant's formula (I), where R¹-R⁸ are hydrogen, Ar¹ is a substituted aryl group having 6 nuclear carbon atoms and the two substituents are both aryl groups (phenyl groups), and Ar² is an unsubstituted aryl group having 20 nuclear carbon atoms (claims 1 and 4). Compound B10,



, reads on applicant's formula (I), where R¹-R⁸ are hydrogen, Ar¹ is a substituted aryl group having 6 nuclear carbon atoms and the two substituents are both aryl group (phenyl and biphenyl), and Ar² is an substituted aryl group having 14 nuclear carbon atoms, where the aryl group that is the substituent is



(claims 1 and 4). Compound B10 reads on applicant's formula (II), where a and b are zero, c is 1, n is 1, Ar is a substituted aryl group having 14 nuclear carbon



atoms, where the aryl group that is the substituent is , Ar' is an unsubstituted aryl group having 6 nuclear carbon atoms, and X is an unsubstituted aryl

Art Unit: 1786

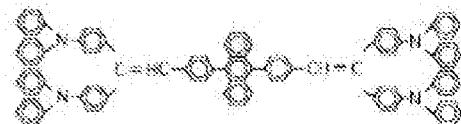
group having 12 nuclear carbon atoms (claims 1 and 5). Ikeda further teaches the blue light emitting layer has a thickness of 40 nm (paragraphs [0143] and [0151]).

13. Ikeda does not teach where the organic electroluminescent device emits white light and furthers comprises a yellow light emitting layer, wherein the yellow light emitting layer comprises the same host material as the blue light emitting layer and contains a dopant with multiple fluoranthene skeletons. Furthermore, Ikeda does not teach where the blue light emitting dopant meets applicant's formula (iii).

14. Fukuoka teaches a white light organic electroluminescent device, comprising in order an anode, a bluish color light emitting layer disposed on the anode, a yellow-to-reddish color light emitting layer disposed on the bluish color light emitting layer and a cathode disposed on the yellow-to-reddish color light emitting layer (paragraph [0013]). Fukuoka teaches that the yellow-to-reddish color light emitting layer contains the same host material as the bluish color light emitting layer (paragraph [0038]). Fukuoka further teaches the yellow-to-reddish color light emitting layer comprises a dopant, which is a compound having multiple fluoranthene skeletons (paragraphs [0038]-[0043], [0048]-[0050], and [0052]). Fukuoka teaches the yellow-to-reddish color dopant has a fluorescent peak wavelength 540 nm to 700 nm (paragraph [0058]). Fukuoka teaches the bluish color light emitting layer can have a thickness of 5 nm to 30 nm and the thickness of the yellow-to-reddish light emitting layer is 10 nm to 50 nm (claim 12) (paragraph [0059]). Fukuoka teaches this type of organic electroluminescent device produces a white light organic electroluminescent device with increased luminous efficiency and better white luminescence (paragraphs [0004]-[0006]).

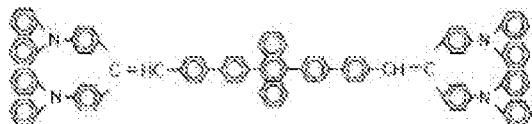
Art Unit: 1786

15. Azuma teaches blue light emitting materials and teaches the materials meet formula (I) (paragraphs [0008]). Azuma teaches the compounds of formula (I) can have



the following structure,

and



(compounds (1) and (9), paragraphs [0038] and

[0039]). Both of these compounds are styrylamines and meets applicant's formula (iii), where A is a fused aromatic ring having 14 carbon atoms, r is two, b are substituted phenyl groups (aryl groups having 6 carbon atoms). Azuma teaches in Table 1 (paragraph [0073]), that compound (9) emits blue light by itself (example 5).

16. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify to electroluminescent device of Ikeda to include a yellow-to-reddish color light emitting layer disposed between the bluish color light emitting layer and the cathode, wherein the yellow-to-reddish color light emitting layer comprises the same host material as the bluish color light emitting layer, a dopant with a fluorescent peak wavelength of 540 nm to 700 nm, and a compound having multiple fluoranthene skeletons, and wherein the thickness of the both light emitting layer is above 5 nm. The motivation would have been to produce a white light organic electroluminescent device with increased luminous efficiency and better white luminescence. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the blue light emitting styrylamines of Ikeda for the blue light emitting

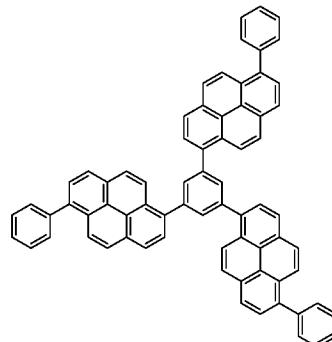
styrylamines, such as compounds (1) and (9) of Azuma. The substitution would have been one known blue light emitting styrylamine for another blue light emitting styrylamine and would lead to the predictable results of using the compounds of Azuma as blue light emitting styrylamines.

17. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (WO 03/087023), wherein Ikeda et al. (US 2005/0214565) (hereafter "Ikeda") is used as the English translation, in view of Fukuoka et al. (JP 2003-272857) (hereafter "Fukuoka"), wherein a machine translation if used as the English translation, and Azuma et al. (JP2000-007604) (hereafter "Azuma"), where a machine translation is used as the English translation, as applied to claims 1-5 and 8-20 above, and further in view of Suzuki et al. (US 2002/0177009) (hereafter "Suzuki").

18. Ikeda in view of Fukuoka and Azuma does not teach where the asymmetric compound is a compound that comprises a pyrene (formulae (V)-(IX)).

19. Suzuki teaches an organic luminescent device wherein the blue light emitting layer comprises an asymmetric pyrene compound (paragraphs [0093]-[0101], compound 27). Suzuki teaches formula (X), which can be bound to any of the formula (I)-(VII) (paragraph [0020]). Suzuki further teaches that R₂₁ can be a substituted or unsubstituted aryl group, such as phenyl, biphenyl, and terphenyl (paragraphs [0021] and [0035]) leading to asymmetric pyrene groups. In compound 27, Suzuki teaches an asymmetric pyrene wherein both the applicant's Ar³ and Ar⁴ positions in formula (V) contain either a substituted or unsubstituted aryl group. This teaching by Suzuki can

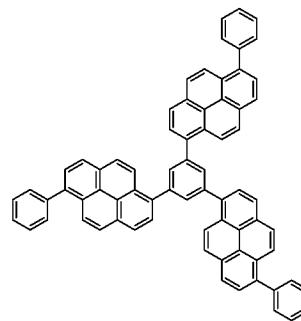
Art Unit: 1786



lead to a compound with the following formula,

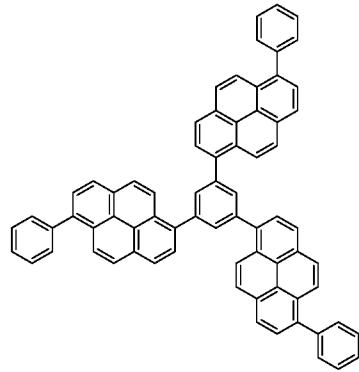
V is used from Suzuki, and R²¹ is phenyl, Ar₁₂-Ar₁₃ are formula (X), and R₁₄-R₁₆ are hydrogen.

20. It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed an asymmetric compounds using formula (X) of Suzuki because Suzuki teaches that R₂₁ can be a substituted or unsubstituted aryl group, such as phenyl, biphenyl, and terphenyl, and the pyrene unit further comprises a substituted phenyl group, which would result in asymmetric compounds and this can lead to a



compound with the following formula,

One would expect the formation and use of an asymmetric compound using formula (X) to result in a device having very high efficiency and luminance because such a compound is within the teachings of Suzuki as a desirable material for forming an organic layer of an organic



electroluminescent device. This compound, c1ccc(cc1)-c2ccc(cc2)-c3ccc(cc3)-c4ccc(cc4)-c5ccc(cc5)C=C(c6ccc(cc6)-c7ccc(cc7)-c8ccc(cc8)C=C(c9ccc(cc9)-c10ccc(cc10)C=C(c11ccc(cc11)-c12ccc(cc12)-c13ccc(cc13)C=C(c14ccc(cc14)-c15ccc(cc15)-c16ccc(cc16)C=C(c17ccc(cc17)-c18ccc(cc18)-c19ccc(cc19)C=C(c20ccc(cc20)-c21ccc(cc21)-c22ccc(cc22)C=C(c23ccc(cc23)-c24ccc(cc24)-c25ccc(cc25)C=C(c26ccc(cc26)-c27ccc(cc27)-c28ccc(cc28)C=C(c29ccc(cc29)-c30ccc(cc30)-c31ccc(cc31)C=C(c32ccc(cc32)-c33ccc(cc33)-c34ccc(cc34)C=C(c35ccc(cc35)-c36ccc(cc36)-c37ccc(cc37)C=C(c38ccc(cc38)-c39ccc(cc39)-c40ccc(cc40)C=C(c41ccc(cc41)-c42ccc(cc42)-c43ccc(cc43)C=C(c44ccc(cc44)-c45ccc(cc45)-c46ccc(cc46)C=C(c47ccc(cc47)-c48ccc(cc48)-c49ccc(cc49)C=C(c50ccc(cc50)-c51ccc(cc51)-c52ccc(cc52)C=C(c53ccc(cc53)-c54ccc(cc54)-c55ccc(cc55)C=C(c56ccc(cc56)-c57ccc(cc57)-c58ccc(cc58)C=C(c59ccc(cc59)-c60ccc(cc60)-c61ccc(cc61)C=C(c62ccc(cc62)-c63ccc(cc63)-c64ccc(cc64)C=C(c65ccc(cc65)-c66ccc(cc66)-c67ccc(cc67)C=C(c68ccc(cc68)-c69ccc(cc69)-c70ccc(cc70)C=C(c71ccc(cc71)-c72ccc(cc72)-c73ccc(cc73)C=C(c74ccc(cc74)-c75ccc(cc75)-c76ccc(cc76)C=C(c77ccc(cc77)-c78ccc(cc78)-c79ccc(cc79)C=C(c80ccc(cc80)-c81ccc(cc81)-c82ccc(cc82)C=C(c83ccc(cc83)-c84ccc(cc84)-c85ccc(cc85)C=C(c86ccc(cc86)-c87ccc(cc87)-c88ccc(cc88)C=C(c89ccc(cc89)-c90ccc(cc90)-c91ccc(cc91)C=C(c92ccc(cc92)-c93ccc(cc93)-c94ccc(cc94)C=C(c95ccc(cc95)-c96ccc(cc96)-c97ccc(cc97)C=C(c98ccc(cc98)-c99ccc(cc99)-c100ccc(cc100)C=C(c101ccc(cc101)-c102ccc(cc102)-c103ccc(cc103)C=C(c104ccc(cc104)-c105ccc(cc105)-c106ccc(cc106)C=C(c107ccc(cc107)-c108ccc(cc108)-c109ccc(cc109)C=C(c110ccc(cc110)-c111ccc(cc111)-c112ccc(cc112)C=C(c113ccc(cc113)-c114ccc(cc114)-c115ccc(cc115)C=C(c116ccc(cc116)-c117ccc(cc117)-c118ccc(cc118)C=C(c119ccc(cc119)-c120ccc(cc120)-c121ccc(cc121)C=C(c122ccc(cc122)-c123ccc(cc123)-c124ccc(cc124)C=C(c125ccc(cc125)-c126ccc(cc126)-c127ccc(cc127)C=C(c128ccc(cc128)-c129ccc(cc129)-c130ccc(cc130)C=C(c131ccc(cc131)-c132ccc(cc132)-c133ccc(cc133)C=C(c134ccc(cc134)-c135ccc(cc135)-c136ccc(cc136)C=C(c137ccc(cc137)-c138ccc(cc138)-c139ccc(cc139)C=C(c140ccc(cc140)-c141ccc(cc141)-c142ccc(cc142)C=C(c143ccc(cc143)-c144ccc(cc144)-c145ccc(cc145)C=C(c146ccc(cc146)-c147ccc(cc147)-c148ccc(cc148)C=C(c149ccc(cc149)-c150ccc(cc150)-c151ccc(cc151)C=C(c152ccc(cc152)-c153ccc(cc153)-c154ccc(cc154)C=C(c155ccc(cc155)-c156ccc(cc156)-c157ccc(cc157)C=C(c158ccc(cc158)-c159ccc(cc159)-c160ccc(cc160)C=C(c161ccc(cc161)-c162ccc(cc162)-c163ccc(cc163)C=C(c164ccc(cc164)-c165ccc(cc165)-c166ccc(cc166)C=C(c167ccc(cc167)-c168ccc(cc168)-c169ccc(cc169)C=C(c170ccc(cc170)-c171ccc(cc171)-c172ccc(cc172)C=C(c173ccc(cc173)-c174ccc(cc174)-c175ccc(cc175)C=C(c176ccc(cc176)-c177ccc(cc177)-c178ccc(cc178)C=C(c179ccc(cc179)-c180ccc(cc180)-c181ccc(cc181)C=C(c182ccc(cc182)-c183ccc(cc183)-c184ccc(cc184)C=C(c185ccc(cc185)-c186ccc(cc186)-c187ccc(cc187)C=C(c188ccc(cc188)-c189ccc(cc189)-c190ccc(cc190)C=C(c191ccc(cc191)-c192ccc(cc192)-c193ccc(cc193)C=C(c194ccc(cc194)-c195ccc(cc195)-c196ccc(cc196)C=C(c197ccc(cc197)-c198ccc(cc198)-c199ccc(cc199)C=C(c200ccc(cc200)-c201ccc(cc201)-c202ccc(cc202)C=C(c203ccc(cc203)-c204ccc(cc204)-c205ccc(cc205)C=C(c206ccc(cc206)-c207ccc(cc207)-c208ccc(cc208)C=C(c209ccc(cc209)-c210ccc(cc210)-c211ccc(cc211)C=C(c212ccc(cc212)-c213ccc(cc213)-c214ccc(cc214)C=C(c215ccc(cc215)-c216ccc(cc216)-c217ccc(cc217)C=C(c218ccc(cc218)-c219ccc(cc219)-c220ccc(cc220)C=C(c221ccc(cc221)-c222ccc(cc222)-c223ccc(cc223)C=C(c224ccc(cc224)-c225ccc(cc225)-c226ccc(cc226)C=C(c227ccc(cc227)-c228ccc(cc228)-c229ccc(cc229)C=C(c230ccc(cc230)-c231ccc(cc231)-c232ccc(cc232)C=C(c233ccc(cc233)-c234ccc(cc234)-c235ccc(cc235)C=C(c236ccc(cc236)-c237ccc(cc237)-c238ccc(cc238)C=C(c239ccc(cc239)-c240ccc(cc240)-c241ccc(cc241)C=C(c242ccc(cc242)-c243ccc(cc243)-c244ccc(cc244)C=C(c245ccc(cc245)-c246ccc(cc246)-c247ccc(cc247)C=C(c248ccc(cc248)-c249ccc(cc249)-c250ccc(cc250)C=C(c251ccc(cc251)-c252ccc(cc252)-c253ccc(cc253)C=C(c254ccc(cc254)-c255ccc(cc255)-c256ccc(cc256)C=C(c257ccc(cc257)-c258ccc(cc258)-c259ccc(cc259)C=C(c260ccc(cc260)-c261ccc(cc261)-c262ccc(cc262)C=C(c263ccc(cc263)-c264ccc(cc264)-c265ccc(cc265)C=C(c266ccc(cc266)-c267ccc(cc267)-c268ccc(cc268)C=C(c269ccc(cc269)-c270ccc(cc270)-c271ccc(cc271)C=C(c272ccc(cc272)-c273ccc(cc273)-c274ccc(cc274)C=C(c275ccc(cc275)-c276ccc(cc276)-c277ccc(cc277)C=C(c278ccc(cc278)-c279ccc(cc279)-c280ccc(cc280)C=C(c281ccc(cc281)-c282ccc(cc282)-c283ccc(cc283)C=C(c284ccc(cc284)-c285ccc(cc285)-c286ccc(cc286)C=C(c287ccc(cc287)-c288ccc(cc288)-c289ccc(cc289)C=C(c290ccc(cc290)-c291ccc(cc291)-c292ccc(cc292)C=C(c293ccc(cc293)-c294ccc(cc294)-c295ccc(cc295)C=C(c296ccc(cc296)-c297ccc(cc297)-c298ccc(cc298)C=C(c299ccc(cc299)-c300ccc(cc300)-c301ccc(cc301)C=C(c302ccc(cc302)-c303ccc(cc303)-c304ccc(cc304)C=C(c305ccc(cc305)-c306ccc(cc306)-c307ccc(cc307)C=C(c308ccc(cc308)-c309ccc(cc309)-c310ccc(cc310)C=C(c311ccc(cc311)-c312ccc(cc312)-c313ccc(cc313)C=C(c314ccc(cc314)-c315ccc(cc315)-c316ccc(cc316)C=C(c317ccc(cc317)-c318ccc(cc318)-c319ccc(cc319)C=C(c320ccc(cc320)-c321ccc(cc321)-c322ccc(cc322)C=C(c323ccc(cc323)-c324ccc(cc324)-c325ccc(cc325)C=C(c326ccc(cc326)-c327ccc(cc327)-c328ccc(cc328)C=C(c329ccc(cc329)-c330ccc(cc330)-c331ccc(cc331)C=C(c332ccc(cc332)-c333ccc(cc333)-c334ccc(cc334)C=C(c335ccc(cc335)-c336ccc(cc336)-c337ccc(cc337)C=C(c338ccc(cc338)-c339ccc(cc339)-c340ccc(cc340)C=C(c341ccc(cc341)-c342ccc(cc342)-c343ccc(cc343)C=C(c344ccc(cc344)-c345ccc(cc345)-c346ccc(cc346)C=C(c347ccc(cc347)-c348ccc(cc348)-c349ccc(cc349)C=C(c350ccc(cc350)-c351ccc(cc351)-c352ccc(cc352)C=C(c353ccc(cc353)-c354ccc(cc354)-c355ccc(cc355)C=C(c356ccc(cc356)-c357ccc(cc357)-c358ccc(cc358)C=C(c359ccc(cc359)-c360ccc(cc360)-c361ccc(cc361)C=C(c362ccc(cc362)-c363ccc(cc363)-c364ccc(cc364)C=C(c365ccc(cc365)-c366ccc(cc366)-c367ccc(cc367)C=C(c368ccc(cc368)-c369ccc(cc369)-c370ccc(cc370)C=C(c371ccc(cc371)-c372ccc(cc372)-c373ccc(cc373)C=C(c374ccc(cc374)-c375ccc(cc375)-c376ccc(cc376)C=C(c377ccc(cc377)-c378ccc(cc378)-c379ccc(cc379)C=C(c380ccc(cc380)-c381ccc(cc381)-c382ccc(cc382)C=C(c383ccc(cc383)-c384ccc(cc384)-c385ccc(cc385)C=C(c386ccc(cc386)-c387ccc(cc387)-c388ccc(cc388)C=C(c389ccc(cc389)-c390ccc(cc390)-c391ccc(cc391)C=C(c392ccc(cc392)-c393ccc(cc393)-c394ccc(cc394)C=C(c395ccc(cc395)-c396ccc(cc396)-c397ccc(cc397)C=C(c398ccc(cc398)-c399ccc(cc399)-c400ccc(cc400)C=C(c401ccc(cc401)-c402ccc(cc402)-c403ccc(cc403)C=C(c404ccc(cc404)-c405ccc(cc405)-c406ccc(cc406)C=C(c407ccc(cc407)-c408ccc(cc408)-c409ccc(cc409)C=C(c410ccc(cc410)-c411ccc(cc411)-c412ccc(cc412)C=C(c413ccc(cc413)-c414ccc(cc414)-c415ccc(cc415)C=C(c416ccc(cc416)-c417ccc(cc417)-c418ccc(cc418)C=C(c419ccc(cc419)-c420ccc(cc420)-c421ccc(cc421)C=C(c422ccc(cc422)-c423ccc(cc423)-c424ccc(cc424)C=C(c425ccc(cc425)-c426ccc(cc426)-c427ccc(cc427)C=C(c428ccc(cc428)-c429ccc(cc429)-c430ccc(cc430)C=C(c431ccc(cc431)-c432ccc(cc432)-c433ccc(cc433)C=C(c434ccc(cc434)-c435ccc(cc435)-c436ccc(cc436)C=C(c437ccc(cc437)-c438ccc(cc438)-c439ccc(cc439)C=C(c440ccc(cc440)-c441ccc(cc441)-c442ccc(cc442)C=C(c443ccc(cc443)-c444ccc(cc444)-c445ccc(cc445)C=C(c446ccc(cc446)-c447ccc(cc447)-c448ccc(cc448)C=C(c449ccc(cc449)-c450ccc(cc450)-c451ccc(cc451)C=C(c452ccc(cc452)-c453ccc(cc453)-c454ccc(cc454)C=C(c455ccc(cc455)-c456ccc(cc456)-c457ccc(cc457)C=C(c458ccc(cc458)-c459ccc(cc459)-c460ccc(cc460)C=C(c461ccc(cc461)-c462ccc(cc462)-c463ccc(cc463)C=C(c464ccc(cc464)-c465ccc(cc465)-c466ccc(cc466)C=C(c467ccc(cc467)-c468ccc(cc468)-c469ccc(cc469)C=C(c470ccc(cc470)-c471ccc(cc471)-c472ccc(cc472)C=C(c473ccc(cc473)-c474ccc(cc474)-c475ccc(cc475)C=C(c476ccc(cc476)-c477ccc(cc477)-c478ccc(cc478)C=C(c479ccc(cc479)-c480ccc(cc480)-c481ccc(cc481)C=C(c482ccc(cc482)-c483ccc(cc483)-c484ccc(cc484)C=C(c485ccc(cc485)-c486ccc(cc486)-c487ccc(cc487)C=C(c488ccc(cc488)-c489ccc(cc489)-c490ccc(cc490)C=C(c491ccc(cc491)-c492ccc(cc492)-c493ccc(cc493)C=C(c494ccc(cc494)-c495ccc(cc495)-c496ccc(cc496)C=C(c497ccc(cc497)-c498ccc(cc498)-c499ccc(cc499)C=C(c500ccc(cc500)-c501ccc(cc501)-c502ccc(cc502)C=C(c503ccc(cc503)-c504ccc(cc504)-c505ccc(cc505)C=C(c506ccc(cc506)-c507ccc(cc507)-c508ccc(cc508)C=C(c509ccc(cc509)-c510ccc(cc510)-c511ccc(cc511)C=C(c512ccc(cc512)-c513ccc(cc513)-c514ccc(cc514)C=C(c515ccc(cc515)-c516ccc(cc516)-c517ccc(cc517)C=C(c518ccc(cc518)-c519ccc(cc519)-c520ccc(cc520)C=C(c521ccc(cc521)-c522ccc(cc522)-c523ccc(cc523)C=C(c524ccc(cc524)-c525ccc(cc525)-c526ccc(cc526)C=C(c527ccc(cc527)-c528ccc(cc528)-c529ccc(cc529)C=C(c530ccc(cc530)-c531ccc(cc531)-c532ccc(cc532)C=C(c533ccc(cc533)-c534ccc(cc534)-c535ccc(cc535)C=C(c536ccc(cc536)-c537ccc(cc537)-c538ccc(cc538)C=C(c539ccc(cc539)-c540ccc(cc540)-c541ccc(cc541)C=C(c542ccc(cc542)-c543ccc(cc543)-c544ccc(cc544)C=C(c545ccc(cc545)-c546ccc(cc546)-c547ccc(cc547)C=C(c548ccc(cc548)-c549ccc(cc549)-c550ccc(cc550)C=C(c551ccc(cc551)-c552ccc(cc552)-c553ccc(cc553)C=C(c554ccc(cc554)-c555ccc(cc555)-c556ccc(cc556)C=C(c557ccc(cc557)-c558ccc(cc558)-c559ccc(cc559)C=C(c560ccc(cc560)-c561ccc(cc561)-c562ccc(cc562)C=C(c563ccc(cc563)-c564ccc(cc564)-c565ccc(cc565)C=C(c566ccc(cc566)-c567ccc(cc567)-c568ccc(cc568)C=C(c569ccc(cc569)-c570ccc(cc570)-c571ccc(cc571)C=C(c572ccc(cc572)-c573ccc(cc573)-c574ccc(cc574)C=C(c575ccc(cc575)-c576ccc(cc576)-c577ccc(cc577)C=C(c578ccc(cc578)-c579ccc(cc579)-c580ccc(cc580)C=C(c581ccc(cc581)-c582ccc(cc582)-c583ccc(cc583)C=C(c584ccc(cc584)-c585ccc(cc585)-c586ccc(cc586)C=C(c587ccc(cc587)-c588ccc(cc588)-c589ccc(cc589)C=C(c590ccc(cc590)-c591ccc(cc591)-c592ccc(cc592)C=C(c593ccc(cc593)-c594ccc(cc594)-c595ccc(cc595)C=C(c596ccc(cc596)-c597ccc(cc597)-c598ccc(cc598)C=C(c599ccc(cc599)-c600ccc(cc600)-c601ccc(cc601)C=C(c602ccc(cc602)-c603ccc(cc603)-c604ccc(cc604)C=C(c605ccc(cc605)-c606ccc(cc606)-c607ccc(cc607)C=C(c608ccc(cc608)-c609ccc(cc609)-c610ccc(cc610)C=C(c611ccc(cc611)-c612ccc(cc612)-c613ccc(cc613)C=C(c614ccc(cc614)-c615ccc(cc615)-c616ccc(cc616)C=C(c617ccc(cc617)-c618ccc(cc618)-c619ccc(cc619)C=C(c620ccc(cc620)-c621ccc(cc621)-c622ccc(cc622)C=C(c623ccc(cc623)-c624ccc(cc624)-c625ccc(cc625)C=C(c626ccc(cc626)-c627ccc(cc627)-c628ccc(cc628)C=C(c629ccc(cc629)-c630ccc(cc630)-c631ccc(cc631)C=C(c632ccc(cc632)-c633ccc(cc633)-c634ccc(cc634)C=C(c635ccc(cc635)-c636ccc(cc636)-c637ccc(cc637)C=C(c638ccc(cc638)-c639ccc(cc639)-c640ccc(cc640)C=C(c641ccc(cc641)-c642ccc(cc642)-c643ccc(cc643)C=C(c644ccc(cc644)-c645ccc(cc645)-c646ccc(cc646)C=C(c647ccc(cc647)-c648ccc(cc648)-c649ccc(cc649)C=C(c650ccc(cc650)-c651ccc(cc651)-c652ccc(cc652)C=C(c653ccc(cc653)-c654ccc(cc654)-c655ccc(cc655)C=C(c656ccc(cc656)-c657ccc(cc657)-c658ccc(cc658)C=C(c659ccc(cc659)-c660ccc(cc660)-c661ccc(cc661)C=C(c662ccc(cc662)-c663ccc(cc663)-c664ccc(cc664)C=C(c665ccc(cc665)-c666ccc(cc666)-c667ccc(cc667)C=C(c668ccc(cc668)-c669ccc(cc669)-c670ccc(cc670)C=C(c671ccc(cc671)-c672ccc(cc672)-c673ccc(cc673)C=C(c674ccc(cc674)-c675ccc(cc675)-c676ccc(cc676)C=C(c677ccc(cc677)-c678ccc(cc678)-c679ccc(cc679)C=C(c680ccc(cc680)-c681ccc(cc681)-c682ccc(cc682)C=C(c683ccc(cc683)-c684ccc(cc684)-c685ccc(cc685)C=C(c686ccc(cc686)-c687ccc(cc687)-c688ccc(cc688)C=C(c689ccc(cc689)-c690ccc(cc690)-c691ccc(cc691)C=C(c692ccc(cc692)-c693ccc(cc693)-c694ccc(cc694)C=C(c695ccc(cc695)-c696ccc(cc696)-c697ccc(cc697)C=C(c698ccc(cc698)-c699ccc(cc699)-c700ccc(cc700)C=C(c701ccc(cc701)-c702ccc(cc702)-c703ccc(cc703)C=C(c704ccc(cc704)-c705ccc(cc705)-c706ccc(cc706)C=C(c707ccc(cc707)-c708ccc(cc708)-c709ccc(cc709)C=C(c710ccc(cc710)-c711ccc(cc711)-c712ccc(cc712)C=C(c713ccc(cc713)-c714ccc(cc714)-c715ccc(cc715)C=C(c716ccc(cc716)-c717ccc(cc717)-c718ccc(cc718)C=C(c719ccc(cc719)-c720ccc(cc720)-c721ccc(cc721)C=C(c722ccc(cc722)-c723ccc(cc723)-c724ccc(cc724)C=C(c725ccc(cc725)-c726ccc(cc726)-c727ccc(cc727)C=C(c728ccc(cc728)-c729ccc(cc729)-c730ccc(cc730)C=C(c731ccc(cc731)-c732ccc(cc732)-c733ccc(cc733)C=C(c734ccc(cc734)-c735ccc(cc735)-c736ccc(cc736)C=C(c737ccc(cc737)-c738ccc(cc738)-c739ccc(cc739)C=C(c740ccc(cc740)-c741ccc(cc741)-c742ccc(cc742)C=C(c743ccc(cc743)-c744ccc(cc744)-c745ccc(cc745)C=C(c746ccc(cc746)-c747ccc(cc747)-c748ccc(cc748)C=C(c749ccc(cc749)-c750ccc(cc750)-c751ccc(cc751)C=C(c752ccc(cc752)-c753ccc(cc753)-c754ccc(cc754)C=C(c755ccc(cc755)-c756ccc(cc756)-c757ccc(cc757)C=C(c758ccc(cc758)-c759ccc(cc759)-c760ccc(cc760)C=C(c761ccc(cc761)-c762ccc(cc762)-c763ccc(cc763)C=C(c764ccc(cc764)-c765ccc(cc765)-c766ccc(cc766)C=C(c767ccc(cc767)-c768ccc(cc768)-c769ccc(cc769)C=C(c770ccc(cc770)-c771ccc(cc771)-c772ccc(cc772)C=C(c773ccc(cc773)-c774ccc(cc774)-c775ccc(cc775)C=C(c776ccc(cc776)-c777ccc(cc777)-c778ccc(cc778)C=C(c779ccc(cc779)-c780ccc(cc780)-c781ccc(cc781)C=C(c782ccc(cc782)-c783ccc(cc783)-c784ccc(cc784)C=C(c785ccc(cc785)-c786ccc(cc786)-c787ccc(cc787)C=C(c788ccc(cc788)-c789ccc(cc789)-c790ccc(cc790)C=C(c791ccc(cc791)-c792ccc(cc792)-c793ccc(cc793)C=C(c794ccc(cc794)-c795ccc(cc795)-c796ccc(cc796)C=C(c797ccc(cc797)-c798ccc(cc798)-c799ccc(cc799)C=C(c800ccc(cc800)-c801ccc(cc801)-c802ccc(cc802)C=C(c803ccc(cc803)-c804ccc(cc804)-c805ccc(cc805)C=C(c806ccc(cc806)-c807ccc(cc807)-c808ccc(cc808)C=C(c809ccc(cc809)-c810ccc(cc810)-c811ccc(cc811)C=C(c812ccc(cc812)-c813ccc(cc813)-c814ccc(cc814)C=C(c815ccc(cc815)-c816ccc(cc816)-c817ccc(cc817)C=C(c818ccc(cc818)-c819ccc(cc819)-c820ccc(cc820)C=C(c821ccc(cc821)-c822ccc(cc822)-c823ccc(cc823)C=C(c824ccc(cc824)-c825ccc(cc825)-c826ccc(cc826)C=C(c827ccc(cc827)-c828ccc(cc828)-c829ccc(cc829)C=C(c830ccc(cc830)-c831ccc(cc831)-c832ccc(cc832)C=C(c833ccc(cc833)-c834ccc(cc834)-c835ccc(cc835)C=C(c836ccc(cc836)-c837ccc(cc837)-c838ccc(cc838)C=C(c839ccc(cc839)-c840ccc(cc840)-c841ccc(cc841)C=C(c842ccc(cc842)-c843ccc(cc843)-c844ccc(cc844)C=C(c845ccc(cc845)-c846ccc(cc846)-c847ccc(cc847)C=C(c848ccc(cc848)-c849ccc(cc849)-c850ccc(cc850)C=C(c851ccc(cc851)-c852ccc(cc852)-c853ccc(cc853)C=C(c854ccc(cc854)-c855ccc(cc855)-c856ccc(cc856)C=C(c857ccc(cc857)-c858ccc(cc858)-c859ccc(cc859)C=C(c860ccc(cc860)-c861ccc(cc861)-c862ccc(cc862)C=C(c863ccc(cc863)-c864ccc(cc864)-c865ccc(cc865)C=C(c866ccc(cc866)-c867ccc(cc867)-c868ccc(cc868)C=C(c869ccc(cc869)-c870ccc(cc870)-c871ccc(cc871)C=C(c872ccc(cc872)-c873ccc(cc873)-c874ccc(cc874)C=C(c875ccc(cc875)-c876ccc(cc876)-c877ccc(cc877)C=C(c878ccc(cc878)-c879ccc(cc879)-c880ccc(cc880)C=C(c881ccc(cc881)-c882ccc(cc882)-c883ccc(cc883)C=C(c884ccc(cc884)-c885ccc(cc885)-c886ccc(cc886)C=C(c887ccc(cc887)-c888ccc(cc888)-c889ccc(cc889)C=C(c890ccc(cc890)-c891ccc(cc891)-c892ccc(cc892)C=C(c893ccc(cc893)-c894ccc(cc894)-c895ccc(cc895)C=C(c896ccc(cc896)-c897ccc(cc897)-c898ccc(cc898)C=C(c899ccc(cc899)-c900ccc(cc900)-c901ccc(cc901)C=C(c902ccc(cc902)-c903ccc(cc903)-c904ccc(cc904)C=C(c905ccc(cc905)-c906ccc(cc906)-c907ccc(cc907)C=C(c908ccc(cc908)-c909ccc(cc909)-c910ccc(cc910)C=C(c911ccc(cc911)-c912ccc(cc912)-c913ccc(cc913)C=C(c914ccc(cc914)-c915ccc(cc915)-c916ccc(cc916)C=C(c917ccc(cc917)-c918ccc(cc918)-c919ccc(cc919)C=C(c920ccc(cc920)-c921ccc(cc921)-c922ccc(cc922)C=C(c923ccc(cc923)-c924ccc(cc924)-c925ccc(cc925)C=C(c926ccc(cc926)-c927ccc(cc927)-c928ccc(cc928)C=C(c929ccc(cc929)-c930ccc(cc930)-c931ccc(cc931)C=C(c932ccc(cc932)-c933ccc(cc933)-c934ccc(cc934)C=C(c935ccc(cc935)-c936ccc(cc936)-c937ccc(cc937)C=C(c938ccc(cc938)-c939ccc(cc939)-c940ccc(cc940)C=C(c941ccc(cc941)-c942ccc(cc942)-c943ccc(cc943)C=C(c944ccc(cc944)-c945ccc(cc945)-c946ccc(cc946)C=C(c947ccc(cc947)-c948ccc(cc948)-c949ccc(cc949)C=C(c950ccc(cc950)-c951ccc(cc951)-c952ccc(cc952)C=C(c953ccc(cc953)-c954ccc(cc954)-c955ccc(cc955)C=C(c956ccc(cc956)-c957ccc(cc957)-c958ccc(cc958)C=C(c959ccc(cc959)-c960ccc(cc960)-c961ccc(cc961)C=C(c962ccc(cc962)-c963ccc(cc963)-c964ccc(cc964)C=C(c965ccc(cc965)-c966ccc(cc966)-c967ccc(cc967)C=C(c968ccc(cc968)-c969ccc(cc969)-c970ccc(cc970)C=C(c971ccc(cc971)-c972ccc(cc972)-c973ccc(cc973)C=C(c974ccc(cc974)-c975ccc(cc975)-c976ccc(cc976)C=C(c977ccc(cc977)-c978ccc(cc978)-c979ccc(cc979)C=C(c980ccc(cc980)-c981ccc(cc981)-c982ccc(cc982)C=C(c983ccc(cc983)-c984ccc(cc984)-c985ccc(cc985)C=C(c986ccc(cc986)-c987ccc(cc987)-c988ccc(cc988)C=C(c989ccc(cc989)-c990ccc(cc990)-c991ccc(cc991)C=C(c992ccc(cc992)-c993ccc(cc993)-c994ccc(cc994)C=C(c995ccc(cc995)-c996ccc(cc996)-c997ccc(cc997)C=C(c998ccc(cc998)-c999ccc(cc999)-c1000ccc(cc1000))

21. Suzuki also teaches compound 27, an asymmetric pyrene, reads on applicant's formula (VI), where d is 0, e and n¹ are 1, Ar⁵ is an unsubstituted fused aryl group having 16 nuclear carbon atoms, and X² and Ar⁶ are both unsubstituted aryl groups having 32 nuclear atoms.

22. Suzuki teaches the desirable fused polynuclear aromatic compounds provide organic electroluminescent devices with very high efficiency and luminance and high durability (paragraphs [0011] and [0012]).

23. Given the teachings of Suzuki it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electroluminescent device of Ikeda in view of Fukuoka and Azuma with an asymmetric pyrene compound as taught by Suzuki. Suzuki and Ikeda both teach the use of fused polynuclear aromatic compounds are compounds that can be used as light emitting layer of electroluminescence devices, but only Suzuki teaches the use of pyrenes as one of the fused polynuclear aromatic compounds. The motivation would have been to provide

organic electroluminescent devices with very high efficiency and luminance and high durability.

24. Claims 1-5, 8-15, 17, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aziz et al. (EP 1385221) (hereafter "Aziz"), in view of Shi et al. (EP 1009044) (hereafter "Shi"), Fukuoka et al. (JP 2003-272857) (hereafter "Fukuoka"), wherein a machine translation if used as the English translation, and Azuma et al. (JP2000-007604) (hereafter "Azuma"), where a machine translation is used as the English translation.

25. Regarding claims 1-5, 8-15, 17, 19, and 20, Aziz teaches an organic electroluminescent device comprising an anode, a hole transporting layer composed of an arylamine (claim 17), a light emitting layer disposed on the hole transporting layer, an electron transporting layer composed of Alq disposed on the light emitting layer (claims 19 and 20), and a cathode disposed on the electron transporting layer (paragraphs [0014] and [0080]). Aziz teaches the electroluminescent device can comprises a hole injection layer between the hole transporting layer and the anode and the layer can be composed of organic compounds (paragraph [0032]). Aziz further teaches that the light emitting layer is composed of an asymmetric compound and the asymmetric compounds are represented by formulae I(A)(3) and I(A)(6)- I(A)(11) and teaches the compounds that emits blue light and the asymmetric compound can be a host material (claims 2 and 3) (paragraphs [0018]-[0021], [0036], [0059], [0064], [0070], [0073], and [0080]). Aziz does not specifically teach the asymmetric compounds, but

teaches that Shi teaches the compounds an incorporates Shi into the specification; therefore, the asymmetric compounds of Shi can be used in the Aziz reference. Aziz teaches the compounds are used host material for a blue emitting dopants and teaches the dopant can be any blue light emitting material (paragraph [0045], [0046], and [0080]). Aziz further teaches the blue light emitting layer has a thickness of 42 nm (paragraph [0080]).

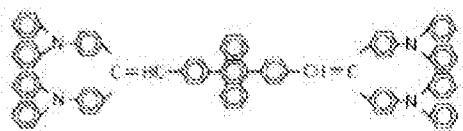
26. Shi teaches several asymmetric compounds that can be incorporated into the Aziz reference that meet Aziz formulae I(A)(3) and I(A)(6)- I(A)(11) (paragraphs [0025] and [0026]). Shi specifically teaches compounds 45-59 as compounds that meet these formulae (paragraph [0026]). Compounds 45 and 50 are a few examples (claims 1, 4, and 5) (paragraphs [0046], [0143], [0146] and [0151]). Compound 50 reads on applicant's formula (I) where R¹-R⁸ are hydrogen, Ar¹ is an unsubstituted aryl group having 10 nuclear carbon atoms, and Ar² is an unsubstituted aryl group having 6 nuclear carbon atoms (claims 1 and 4). Compound 50 reads on applicant's formula (I), where R¹-R⁸ are hydrogen, Ar¹ is a substituted aryl group having 6 nuclear carbon atoms and the two substituents are both aryl groups (phenyl groups), and Ar² is an unsubstituted aryl group having 10 nuclear carbon atoms (claims 1 and 4). Compound 50 reads on applicant's formula (II), where a and b are zero, c is 1 and is an unsubstituted aryl group having 6 carbon atoms, n is 1, Ar is an unsubstituted aryl group having 10 carbon atoms, and Ar' is an unsubstituted aryl group having 6 carbon atoms (claims 1 and 5).

Art Unit: 1786

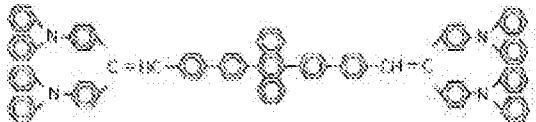
27. Aziz does not teach where the organic electroluminescent device emits white light and further comprises a yellow light emitting layer, wherein the yellow light emitting layer comprises the same host material as the blue light emitting layer and contains a dopant with multiple fluoranthene skeletons. Furthermore, Ikeda does not teach where the blue light emitting dopant meets applicant's formula (iii).

28. Fukuoka teaches a white light organic electroluminescent device, comprising in order an anode, a bluish color light emitting layer disposed on the anode, a yellow-to-reddish color light emitting layer disposed on the bluish color light emitting layer and a cathode disposed on the yellow-to-reddish color light emitting layer (paragraph [0013]). Fukuoka teaches that the yellow-to-reddish color light emitting layer contains the same host material as the bluish color light emitting layer (paragraph [0038]). Fukuoka further teaches the yellow-to-reddish color light emitting layer comprises a dopant, which is a compound having multiple fluoranthene skeletons (paragraphs [0038]-[0043], [0048]-[0050], and [0052]). Fukuoka teaches the yellow-to-reddish color dopant has a fluorescent peak wavelength 540 nm to 700 nm (paragraph [0058]). Fukuoka teaches the bluish color light emitting layer can have a thickness of 5 nm to 30 nm and the thickness of the yellow-to-reddish light emitting layer is 10 nm to 50 nm (claim 12) (paragraph [0059]). Fukuoka teaches this type of organic electroluminescent device produces a white light organic electroluminescent device with increased luminous efficiency and better white luminescence (paragraphs [0004]-[0006]).

29. Azuma teaches blue light emitting materials and teaches the materials meet formula (I) (paragraphs [0008]). Azuma teaches the compounds of formula (I) can have



the following structure, and



(compounds (1) and (9), paragraphs [0038] and [0039]). Both of these compounds are styrylamines and meets applicant's formula (iii), where A is a fused aromatic ring having 14 carbon atoms, r is two, b are substituted phenyl groups (aryl groups having 6 carbon atoms). Azuma teaches in Table 1 (paragraph [0073]), that compound (9) emits blue light by itself (example 5).

30. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify to electroluminescent device of Aziz where the host material in the blue light emitting layer where the asymmetric compounds of Shi, include a yellow-to-reddish color light emitting layer disposed between the bluish color light emitting layer and the cathode, wherein the yellow-to-reddish color light emitting layer comprises the same host material as the bluish color light emitting layer, a dopant with a fluorescent peak wavelength of 540 nm to 700 nm, and a compound having multiple fluoranthene skeletons, and wherein the thickness of the both light emitting layer is above 5 nm. The motivation would have been to produce a white light organic electroluminescent device with increased luminous efficiency and better white luminescence. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the blue light emitting dopants of Aziz for the blue light emitting compounds, such as compounds (1) and (9), of Azuma.

The substitution would have been one known blue light emitting compound for another blue light emitting compound and would lead to the predictable results of using the compounds of Azuma as blue light emitting compounds.

31. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aziz et al. (EP 1385221) (hereafter "Aziz"), in view of Shi et al. (EP 1009044) (hereafter "Shi"), Fukuoka et al. (JP 2003-272857) (hereafter "Fukuoka"), wherein a machine translation if used as the English translation, and Azuma et al. (JP2000-007604) (hereafter "Azuma"), where a machine translation is used as the English translation as applied to claim1-5, 8-15, 17, 19, and 20 above, and further in view of Ikeda et al. (WO 03/087023), wherein Ikeda et al. (US 2005/0214565) (hereafter "Ikeda") is used as the English translation.

32. Regarding claims 16 and 18, Aziz in view of Shi, Fukuoka, and Azuma does not teach where the hole injection layer is composed of TPD232 (applicant's formula (X)) and the transporting layer is composed of BPTPD (applicant's formula (XI)).

33. Ikeda teaches an organic electroluminescent device comprising an anode, a hole injecting layer composed of TPD232 (applicant's formula (X)) disposed on the anode (paragraphs [0143] and [0151]), a hole transporting layer composed of BPTPD (applicant's formula (XI)) disposed on the hole injecting layer (paragraphs [0143] and [0151]), a light emitting layer disposed on the hole transporting layer, an electron transporting layer composed of Alq disposed on the light emitting layer (paragraph

[0143] and [0151]), and a cathode disposed on the electron transporting layer (paragraphs [0143] and [0151]).

34. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the hole injection material of Aziz in view of Shi, Fukuoka, and Azuma for TPD232 as taught by Ikeda and substitute the hole transporting material of Aziz in view of Shi, Fukuoka, and Azuma for BPTPD as taught by Ikeda. The substitutions would have been one known hole injection material for another hole injection material and one known hole transporting material for another hole transporting material and lead to the predictable results of using TPD232 as a hole injection material in an electroluminescent device and using BPTPD as a hole transporting material in an electroluminescent device.

Conclusion

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew K. Bohaty whose telephone number is (571)270-1148. The examiner can normally be reached on Monday through Thursday 7:30 am to 5:00 pm EST and every other Friday from 7:30 am to 4 pm EST.

36. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571)272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1786

37. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K. B./
Andrew K. Bohaty
Patent Examiner, Art Unit 1786

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art
Unit 1786